CLAIMS

1. A catalyst for hydrotreatment of gas oil, comprising from 0.1 to 10% by weight platinum, from 0.1 to 20% by weight palladium, and from 0.05 to 1.2% by weight halogen in terms of the respective elements based on the catalyst in a support comprising an inorganic oxide containing an alumina,

wherein the alumina comprises a crystalline alumina having a crystallite diameter of from 20 to 40 Å.

2. The catalyst according to claim 1, wherein the weight ratio between the platinum and the palladium is from 0.5 to 0.8 in terms of (palladium)/(palladium + platinum) ratio.

3. The catalyst according to claim 1 or 2, wherein the support contains at least one inorganic oxide selected from silica, boria, titania, and zirconia in an amount of from 5 to 60% by weight.

4. The catalyst according to any one of claims 1 to 3, which has an acid amount as determined by the ammonia-TPD method of from 0.4 to 3 mmol/g.

5. The catalyst according to any one of claims 1 to 4, wherein the metal dispersion degree of the catalyst as determined by the CO pulse method after a hydrogen reduction treatment is from 40 to 100%.

6. A method for hydrotreating gas oil, comprising carrying out a catalytic reaction of a gas oil fraction containing an aromatic compound in the presence of the catalyst according to any one of claims 1 to 5 at a hydrogen partial pressure of from 3 to 8 MPa, a temperature of from 200 to 370°C, a liquid hourly space velocity of from 0.3 to 5.0 h^{-1}, and a hydrogen/oil ratio of from 100 to 1,000 L/L.

7. A method for hydrotreating gas oil, comprising:

carrying out, as a first desulfurization step, a catalytic reaction of straight-run gas oil having a boiling point of from 160 to 400°C or blend oil comprising the straight-run gas oil and at least one other hydrocarbon oil at a hydrogen partial pressure of from 3 to 7 MPa, a temperature of from 200 to 400°C, a liquid hourly space velocity of from 0.5 to 5.0 h^{-1}, and a hydrogen/oil ratio of from 100 to 1,000 L/L in the presence of a catalyst

comprising from 10 to 25% by weight at least one metal selected from the Group 6a of the periodic table and from 0.1 to 6% by weight at least one metal selected from the Group 8 of the periodic table in terms of the respective oxides based on the catalyst in a support comprising an inorganic oxide to thereby regulate the oil so as to have a sulfur-containing compound content of 0.2% by weight or lower after the step; and then

carrying out, as a second desulfurization step, a catalytic reaction of the oil after the first desulfurization step at a hydrogen partial pressure of from 3 to 8 MPa, a temperature of from 150 to 370°C, and a liquid hourly space velocity of from 0.3 to 5.0 h^{-1} in the presence of a catalyst comprising from 0.1 to 10% by weight platinum, from 0.1 to 20% by weight palladium, and from 0.05 to 1.2% by weight halogen in terms of the respective elements based on the catalyst in a support comprising an inorganic oxide containing an alumina.

8. The method according to claim 7, wherein after the first desulfurization step, the oil is subjected to a degassing step.

9. The method according to claim 7 or 8, wherein the alumina contained in the support of the catalyst for use in the second desulfurization step comprises a crystalline alumina having a crystallite diameter of from 20 to 40 Å.

10. The method according to any one of claims 7 to 9, wherein in the catalyst for use in the second desulfurization step, the weight ratio between the platinum and the palladium is from 0.5 to 0.8 in terms of (palladium)/(platinum + palladium) ratio.

11. The method according to any one of claims 7 to 10, wherein the support of the catalyst for use in the second desulfurization step contains at least one inorganic oxide selected from silica, boria, titania, and zirconia in an amount of from 1 to 60% by weight.

12. The method according to any one of claims 7 to 11, wherein the catalyst for use in the second desulfurization step has an acid amount as determined by the ammonia-TPD method of from 0.4 to 3 mmol/g.

13. The method according to any one of claims 7 to 12, wherein the catalyst for use in the second desulfurization step, after a hydrogen reduction treatment, has a metal dispersion degree as determined by the CO pulse method of from 40 to 100%.

14. The method according to any one of claims 7 to 13, wherein the catalyst for use in the second desulfurization step is one regenerated by carrying out a reaction for coke deposit removal at an air partial pressure of from 0.05 to 5 MPa and a temperature of from 200 to 800°C.

15. The method according to any one of claims 7 to 14, wherein the catalyst for use in the second desulfurization step is one regenerated by carrying out a reaction for coke deposit removal at an air partial pressure of from 0.05 to 5 MPa and a temperature of from 200 to 800°C and then carrying out a treatment for highly dispersing an active metal in the presence of a chlorine compound at a temperature of from 200 to 800°C.